upper web directly on the lower web already formed or being formed, by wet method, according to a conventional paper-making technique.

To be more precise, the invention relates to a manufacturing process of a composite nonwoven composed of two webs, respectively, a lower web comprising long artificial and/or synthetic fibres, the size of which is between 15 and 80 mm and an upper web comprising short natural fibres, the size of which is between 0.5 and 8 mm.

This process is characterized, on-line, by:

- dispersing first of all the natural fibres into the water,
- then, putting the aqueous dispersion thus obtained on a carded lower web that is about to form or has been manufactured beforehand,
- then filtering the excess water through the lower web,
- then interlacing the fibres of the upper web with the fibres of the lower web with water jets,
- finally drying and then reeling up the obtained composite nonwoven.

In the rest of the description, the expression "artificial and/or synthetic fibres" denotes the fibres chosen from the group comprising, among the artificial fibres, the viscose fibres, and among the synthetic fibres, the polyester, polypropylene, polyamide, polyacrylic, polyvinyl alcohol and polyethylene fibres, as such or as a mixture.

In other words, the main advantage of the process of the invention consists in using short natural fibres, not transformed or treated, especially cellulose fibres that are dispersed directly into the water by conventional paper-making technology.

Further, the dispersion of the fibres into the water during several minutes gives them plastic properties allowing optimising the efficiency of interlacing by water jets as the dispersion is put on the lower web. It follows that

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This process is characterized, on-line, by:

- carding the lower web of said artificial and/or synthetic fibres having a length between 15 and 80 mm, and a dtex degree of at least 1,7 dtex,
- prebonding said lower web,
- dispersing said natural fibres having a length between 0.5 and 8 mm into water to form an aqueous dispersion,
- laying the aqueous dispersion on the carded lower web to form the upper web,
- filtering the excess water through the lower web,
- interlacing the fibres of the upper web with the fibres of the lower web with water jets,
- drying and reeling up the obtained composite nonwoven.

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In other words, the main advantage of the process of the invention consists in using short natural fibres, not transformed or treated, especially cellulose fibres that are dispersed directly into the water by conventional paper-making technology.

In another embodiment, after drying and before the reel-up, the composite, embossed or not, is subjected to a mechanical softening treatment by one of the processes known by an expert of the CLUPAK, SUPATEX, SANFOR or MICREX type.

The nonwovens made with the process of the invention have several advantages. First of all, they are very economic and very absorbent considering the high proportion of natural cellulose fibres representing from 30 to 70 % by weight of the composite. Further, they are very regular due to the wet laid method technology of paper production used for the formation of the upper web. Furthermore, they are very resistant because of the presence of the long fibres in the lower web. Further, the combination of natural fibres and synthetic and/or artificial fibres makes the product both comfortable and stable. Finally, the embossing step able to be inserted before the drying step, possibly combined with the mechanical softening treatment, gives the product an appearance and a textile touch especially attractive to the consumer.

Thus, the nonwovens manufactured according to the process of the invention can not only be used as moisturized towels, especially as wiping towels, but also as tablecloth and table napkins, bath towels, wall covering, upholstery of vehicles, depilatory strips, bags for siccative products, gloves, embroidery, cloths and wiping of printing works.

The invention also relates to an installation for carrying out the previously described process.

In a particular embodiment, the installation comprises:

- ~~a conveyor for transporting the carded lower web that is about to form or has already been manufactured,~~
- ~~a head box set above the conveyor and intended to contain an aqueous dispersion~~ comprising the natural fibres,

In another embodiment, after drying and before the reel-up, the composite, embossed or not, is subjected to a mechanical softening treatment by one of the processes known by an expert of the CLUPAK, SUPATEX, SANFOR or MICREX type.

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The invention also relates to an installation for carrying out the previously described process.

In a particular embodiment, the installation comprises:

- a carding unit for forming a lower web of said artificial and/or synthetic fibres having a length between 15 and 80 mm, and a dtex degree of at least 1,7 dtex,
- a conveyor for transporting a carded lower web,
- a head box set above the conveyor and intended to contain an aqueous dispersion comprising the natural fibres having a length between 0.5 and 8 mm,

- suction means placed under the conveyor and intended to eliminate the excess water as the aqueous dispersion is put on the lower web,
- bonding means by water jets placed above the conveyor and downstream of the conveyor for interlacing the fibres of the upper web with those of the lower web,
- drying means of the composite placed downstream of the conveyor,
- reeling means of the finished dry composite.

In practice, the conveyor is in the form of a metallic or synthetic conveyor perforated in such a way that it allows water to pass therethrough by suction due to suction boxes placed under the said conveyor.

The bonding means by water jets are in the form of several hydraulic injectors provided with perforated plates, each of them comprising one or two rows of holes having a diameter of between 80 and 160 micrometers, the holes of each row being spaced 0.4 – 1.8 mm apart and the rows themselves being spaced 0.5 – 2 mm apart, the measures being taken from axle to axle. In practice, the number of injectors is between 2 and 12, each injector being supplied by water at a pressure of between 20 and 140 bars. Beyond this limit, the obtained products cannot be used as towels.

In the embodiment, according to which the lower web is formed on-line, the installation further comprises manufacturing means of the said web placed upstream of the conveyor.

In this hypothesis, the installation comprises, between the manufacturing means of the lower web and the conveyor, a hydraulic pre-bonding unit having a pre-wetting ramp of the web and a support cylinder around which are placed the hydraulic injectors.

In practice, the manufacturing means of the lower web are in the form of a card followed or not by a spreader-coater.

- suction means set under the conveyor and intended to eliminate the excess water as the aqueous dispersion is put on the lower web,
- bonding means by water jets placed above the conveyor and downstream of the head box, intended to interlace the fibres of the upper web with those of the lower web,
- drying means of the composite placed downstream of the conveyor, and
- reeling means of the dry composite.

In practice, the conveyor is in the form of a metallic or synthetic conveyor perforated in such a way that it allows water to pass therethrough by suction due to suction boxes placed under the said conveyor.

The bonding means by water jets are in the form of several hydraulic injectors provided with perforated plates, each of them comprising one or two rows of holes having a diameter of between 80 and 160 micrometers, the holes of each row being spaced 0.4 – 1.8 mm apart and the rows themselves being spaced 0.5 – 2 mm apart, the measures being taken from axle to axle. In practice, the number of injectors is between 2 and 12, each injector being supplied by water at a pressure of between 20 and 140 bars. Beyond this limit, the obtained products cannot be used as towels.

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In this hypothesis, the installation comprises, between the manufacturing means of the lower web and the conveyor, a hydraulic pre-bonding unit having a pre-wetting ramp of the web and a support cylinder around which are placed the hydraulic injectors.

In practice, the manufacturing means of the lower web are in the form of a card followed or not by a spreader-coater.

CLAIMS

1. A manufacturing process of a composite nonwoven composed of two webs, respectively, a lower web comprising long artificial and/or synthetic fibres, and an upper web comprising short natural fibres, characterized, on-line, by:

- carding the lower web of said artificial and/or synthetic fibres having a length between 15 and 80 mm, and a dtex degree of at least 1,7 dtex,
- prebonding said lower web,
- dispersing said natural fibres having a length between 0.5 and 8 mm into water to form an aqueous dispersion,
- laying the aqueous dispersion on the carded lower web to form the upper web,
- filtering the excess water through the lower web,
- interlacing the fibres of the upper web with the fibres of the lower web with water jets,
- drying and reeling up the obtained composite nonwoven.

2. A process according to claim 1, characterized in that the artificial or synthetic fibres are chosen from the group comprising the viscose, polyester, polypropylene, polyamide, polyacrylic, polyvinyl alcohol and polyethylene fibres, as such or as a mixture.

3. A process according to claim 1, characterized in that the mass of the lower web is at least 25 g/m^2.

4. A process according to claim 1, characterized in that the interlacing of the fibres of the upper web with the fibres of the lower web is obtained by water jets, the number of which is between 2 and 12, each water jet being equipped with perforated plates, each of them comprising one or two rows of holes having a diameter of between 80 and 160 micrometers, the holes of each row being spaced 0.4 – 1.8 mm apart and the rows themselves being spaced 0.5 – 2mm apart, each injector being supplied with water at a pressure of between 20 and 140 bars.

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5. A process according to claim 1, characterized in that the lower web is pre-bonded by means of water jets.

6. A process according to claim 1, characterized in that the lower web makes up between 30 and 70 % by weight of the composite.

7. A process according to claim 1, characterized in that the natural fibres are cellulose fibres.

8. A process according to claim 1, characterized in that the upper web further contains synthetic fibres making up at least 50 % by weight of the web.

9. A process according to claim 1, characterized in that the upper web makes up between 30 and 70 % by weight of the composite.

10. A process according to claim 1, characterized in that the fibres of the upper web are exclusively cellulose fibres, the concentration of the said fibres in the aqueous dispersion being between 0.5 and 10 g/l.

11. A process according to claim 1, characterized in that before drying, the composite is subjected to an embossing step.

12. A process according to claim 1, characterized in that before reeling up, the composite is subjected to a softening step.

13. An installation for carrying out the process object of one of the claims 1 to 12.

14. An installation for manufacturing a composite support composed of two webs, respectively, a lower web comprising long artificial and/or synthetic fibres, and an upper web comprising short natural fibres, characterized by:

- a carding unit for forming a lower web of said artificial and/or synthetic fibres having a length between 15 and 80 mm, and a dtex degree of at least 1,7 dtex,
- a conveyor (3) for transporting a carded lower web,
- a head box (4) set above the conveyor (3) and intended to contain an aqueous dispersion comprising the natural fibres having a length between 0.5 and 8 mm,
- suction means set under the conveyor (3) and intended to eliminate the excess water as the aqueous dispersion is put on the lower web,
- bonding means by water jets (5) placed above the conveyor and downstream of the head box (4), intended to interlace the fibres of the upper web with those of the lower web,
- drying means (9) of the composite placed downstream of the conveyor (3), and
- reeling means (11) of the dry composite.

15. An installation for manufacturing a composite support according to claim 14, characterized in that it comprises bonding means by water jets (5) in form of several hydraulic injectors provided with perforated plates, each of them comprising one or two rows of holes having a diameter of between 80 and 160 micrometers, the holes of each row being spaced 0,4 – 1,8 mm apart and the rows themselves being spaced 0.5 – 2 mm apart, the number of injectors being between 2 and 12 and supplied at a pressure of between 20 and 140 bars.

16. An installation for manufacturing a composite support according to claim 15, characterized in that it comprises manufacturing means (1) of the lower web placed upstream of the conveyor (3).

17. An installation for manufacturing a composite support according to claim 16, characterized in that it comprises, between the manufacturing means of the lower web (1) and the conveyor (3), a hydraulic pre-bonding unit (2) comprising a pre-wetting ramp of the web (2a) and a support roll (2b), around which are placed the hydraulic injectors (2c).

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18. An installation for manufacturing a composite support according to claim 14, characterized in that it comprises, before the drying unit (9), a hydraulic embossing calendar (6) consisting of a suction roll (6a) coated with a wire, the surface of which has an embossed design and hollows, the said roll being associated with hydraulic injectors (6b) placed around its surface.

19. An installation for manufacturing a composite support according to claim 14, characterized in that it also has, prior to the reel-up (11), a softening device (10).